

**UNCLASSIFIED**

---

**AD 295 821**

---

*Reproduced  
by the*

**ARMED SERVICES TECHNICAL INFORMATION AGENCY  
ARLINGTON HALL STATION  
ARLINGTON 12, VIRGINIA**



---

**UNCLASSIFIED**

**NOTICE:** When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

62-955

295 821

PROBLEM LABORATORY STIMULATES GREATER  
CREATIVE WORK

By

A. A. Vorob'ev, G. A. Andreyev, et. al.

ASTIA  
RECEIVED  
FEB 11 1963  
TISIA D

295821

## UNEDITED ROUGH DRAFT TRANSLATION

PROBLEM LABORATORY STIMULATES GREATER CREATIVE WORK

By: Prof. A. A. Vorob'ev and G. A. Andreyev

English Pages: 7

Source: Vestnik Vyshey Shkoly, No. 8, 1960,  
pp 48-51

SC-1587

THIS TRANSLATION IS A RENDITION OF THE ORIGINAL FOREIGN TEXT WITHOUT ANY ANALYTICAL OR EDITORIAL COMMENT. STATEMENTS OR THEORIES ADVOCATED OR IMPLIED ARE THOSE OF THE SOURCE AND DO NOT NECESSARILY REFLECT THE POSITION OR OPINION OF THE FOREIGN TECHNOLOGY DIVISION.

PREPARED BY:

TRANSLATION SERVICES BRANCH  
FOREIGN TECHNOLOGY DIVISION  
WP-APB, ONR.

FTD-TT-62-955/1+4

Date 3 Jan 1963

PROBLEM LABORATORY STIMULATES GREATER  
CREATIVE WORK

Prof. A. A. Vorob'ev, G. A. Andreyev,  
and S. M. Kirov

The problem laboratories founded in 1957 have now become mature scientific collectives, the work of which has given its first—and at times no small—results. We may already speak of the serious influence of the activity in these laboratories on the work of the higher educational institutions where they have been founded. This influence is a most beneficent one: the scientific activity of departments is developing broadly, the efforts of scholars are being concentrated on the solution of current national economic problems, and the laboratories are also exerting a noticeable effect on perfecting the instructional work of the departments.

In this respect the broad development of the scientific activity of a number of departments in the S. M. Kirov Polytechnical Institute in Tomsk after the creation there of a problem laboratory in electronics, dielectrics, and semiconductors (ED and S) is significant.

Organized in 1957 with the departments of physics, high tension technology, electrical insulation, and cable technology as a foundation,

the laboratory united in a general plan the work of thirty-two scientific workers in these departments. Results came rather quickly.

If, for example, before the organization of the problem lab almost no scientific work was carried on in the physics department; during the three years since the foundation of the lab the workers in this department prepared for finals two doctoral and six candidate dissertations, and published more than a hundred articles.

One feature of the laboratory is not its spatial unity (the research is carried on in the teaching areas and on the equipment of the departments), but the unified scientific direction of the work. Right now seventy-three of the institute's scientific workers are doing research in the laboratory, among them three doctors of science, sixteen candidates in science, and twenty-one graduate students.

The laboratory consists of a number of divisions, each of which is occupied with some topic in the two problems to be worked out: physicochemical properties, strength, and failure of dielectrics and semiconductors; creation of radio engineering circuits on semi-conductor gear.

In the divisions of the laboratory electrical, physical, mechanical, and chemical properties of single crystals of alkali-halide salts, their solid solutions, and oxides of metals of the second group in the periodic table of Mendeleev were studied; and a great deal of experimental data was obtained. We have been successful, for example, in drawing important theoretical and practical conclusions as to the connection of electrical, mechanical, and other characteristics of the simplest dielectrics with the energy of their crystal lattice, which created a theoretical basis for the development of dielectrics with preassigned properties.

In the division of physicochemical properties of dielectrics the mechanism of contact layer formation in dielectrics and semi-conductors is being studied.

Extensive data on the conditions and causes of candoluminescence in industrial crystal phosphors under the action of flame were collected by reader V. A. Sokolov and became the foundation of his recently defended doctoral dissertation.

The high-voltage division (chief, I. I. Kalyatskiy, candidate in technical sciences) attained no small success. Here was investigated the electrical strength of ionic solid dielectrics in a wide temperature range in direct and pulsed voltages. It was discovered that in pulses of short duration the discharge in a solid dielectric is similar to the development of discharge in gas. Studying the lag time and speed of discharge in solid dielectrics when acted upon by pulses, workers in the department ascertained that the average discharge velocity increases when the point is of positive polarity, when temperature decreases, and when the energies of the crystal lattice of the dielectrics increase. The results of work on these topics are presented in the candidate dissertations of G. A. Andreyev, A. F. Astafurov, and V. D. Kuchin, defended in 1958.

In the high-voltage division under the direction of reader V. S. Dmitrevskiy and the senior instructor of the department of mine construction M. F. Pisartsev the electrophysical properties of electrically insulating concretes were investigated.

The high-voltage division is participating in the creation of the new high-voltage teaching and research laboratory, the largest in Siberia. Its high-voltage room is already equipped with experimental transformers of 200 and 350 kv, pulse generators of 3 and 1 million v

and 600 kv, and an electric crane. In the open experimental area a cascade of transformers of 1 million v and a gantry have been set up; and the construction of a unique pulse generator of the tower type of 5 million v and of an electrostatic generator of 2.5 million v has been started. When construction is completed the laboratory will have a complex of experimental high-voltage installations on which industrial high-voltage units and designs of the voltage type up to the 200 kv will be preventively tested; besides that, research work studying the properties and behavior of insulation will be extensively developed.

In the division of millimicrosecond technology (chief, G. A. Vorob'ev, candidate in technical sciences) the volt-second characteristics of different dielectrics are studied. It has been found out that in pulses with discharge intervals of the same electrical strength puncture of dielectrics takes place in the following order: solid dielectric—gas—liquid dielectric. It is very important to take this into consideration in the selection and coordination of insulation in practical high-voltage installations. Right now the collective of the section is continuing its study of these questions; the breakdown processes of solid dielectrics in a liquid medium are being investigated.

There are also being developed circuits and devices to get and record on photographic film ultrashort voltage pulses and the construction of a high-speed discharger to protect high-voltage apparatus from excess voltage. Division workers K. K. Sonchik and M. A. Mel'nikov have used the results of their work in the laboratory as the basis of candidate dissertations which have already been defended; and graduate students A. T. Chepikov, G. A. Mesyats, and V. A. Kostrygin have used the same for their articles.

The work which has been carried on by reader I. A. Suslov, the



creation of methods for sizing video amplifiers and constructing miniature television cameras of semiconductor devices, is interesting.

The methods worked out by graduate student I. N. Pustynskiy of calculating low-frequency corrections in video amplifiers of semiconductor triodes were verified experimentally and gave positive results. Since 1958 the section has undertaken the development of miniaturized industrial television cameras for long-range observation at the request of industrial plants. Right now one unit has already been turned over for operation.

The theoretical and experimental work of the laboratory is reflected in 206 articles published in scientific journals by laboratory workers and in six published books. Twelve books and seventy-six articles are at present in press.

After the laboratory had been functioning for three years its workers had given eighty-seven reports and communications at conferences. Seven of the lab workers are working on the provisional commission on electric insulating materials under the State Scientific-Technological Committee of the Council of Ministers of the USSR.

The laboratory has established contact with many large scientific establishments of the country and also with two foreign polytechnical institutes—"Ch'ing-Hua" (Chinese People's Republic) and Jassy (Romania).

The scientific work of the ED and S Laboratory harmonizes with the institute's task—training highly qualified teachers and engineers. One doctoral and eleven candidate dissertations on laboratory subjects have already been defended; the putting of eight candidate and three doctoral dissertations into official form is being completed.

Creation of the laboratory made it possible to carry on complex investigations in the institute.

Three instructors and five graduate students, for example, are studying the processes which go on in the second stage of puncture in solid dielectrics; and workers in the departments of electric insulation and cable technology under the direction of Prof. Ye. K. Zavadovskaya are studying the influence of imperfection in crystals on their electrical properties.

The need for comprehensively investigating the properties of semiconducting materials led to the creation in 1959 of a new chemical section, the head of which became Reader V. V. Boldyrev.

The scientific activity of the large collective of institute instructors has now been given a distinctly expressed direction. As a result the quality of instruction and scientific research has noticeably increased. In this regard the pooling of experience in teaching and research has given much in the continuously active scientific seminar on the physics of dielectrics.

The funds designated for the organization of the ED and S Laboratory have enabled us to reinforce the departments with new and modern equipment.

Many new and efficient units, which are also used in teaching, have put in an appearance. Among them are an electronic microscope, a set of X-ray units, spectrophotometers, spectrometers, and a thermo-camera.

The wide research front on the same problem has enabled us to distribute the equipment correctly among the lab sections and to create groups of workers familiar with it. Research now goes on much more rapidly than before on a completely scientific level and the methods of experimentation are more carefully elaborated. In the division of millimicrosecond technology, for example, high-voltage single-pulse

generators of amplitude to 40 kv and duration to  $3.2 \cdot 10^{-9}$  seconds have been developed. Oscillographs have been constructed, among them ones with two tubes for observing and recording on film of ultrashort pulses with a duration of up to  $10^{-10}$  seconds. The theoretical and practical value of these operations has been repeatedly noticed in conferences on the physics of dielectrics.

Students in the upper courses of the institute have afforded considerable aid to the laboratory. A hundred and five students participated in complex experimental and assembly-and-tuning operations along with the instructors. Students of the department of electric energy ascertained the feasibility of using concrete as a dielectric in high-voltage technology. The realization of this idea permitted a 200-300 thousand ruble saving in the construction of a 22-meter insulation tower for the 5 million v pulse generator set up in the laboratory. Students aided in the assembly of the new high-voltage laboratory for instruction in the department of high tension technology.

The organization of the laboratory made possible considerable strengthening of the institute's relations with Siberian plants. A number of works are now going on according to agreements made with them. At present laboratory workers are in charge of organizing electro-insulation and luminescence laboratories for the Tomsk Council of National Economy.

All the activity of the laboratory is now based on the Party's decisions to accelerate engineering progress. All laboratory sections are directing their efforts toward more rapid and higher-quality fulfillment of the projected operations.

# DISTRIBUTION LIST

DEPARTMENT OF DEFENSE	Nr. Copies	MAJOR AIR COMMANDS	Nr. Copies
		AFSC	
		SCFTR	1
		ASTIA	25
HEADQUARTERS USAF		TD-B1a	5
		TD-B1b	3
AFCIN-3D2	1	AEDC (AEY)	1
ARL (ARB)	1	SSD (SSF)	2
		APGC (PGF)	1
		ESD (ESY)	1
		RADC (RAY)	1
OTHER AGENCIES		AFSWC (SWF)	1
		AFMTC (MTW)	1
CIA	1		
NSA	6		
AID	2		
OTS	2		
AEC	2		
PWS	1		
NASA	1		
RAND	1		